REMARKS

Applicants submit these remarks in response to the Office Action dated May 24, 2004 ("Office Action"). The three-month deadline for filing a response falls on August 24, 2004. Therefore, Applicants believe that this response is being timely filed. In the event that Applicants are incorrect in their assumption, please charge any additional fee to Deposit Account No. 23-2415.

DRAWINGS

The Examiner has noted that the pending application was filed with informal drawings and that Figure 2 is missing from these drawings. However, Substitute Drawings, which included Figure 2, were submitted to the Patent and Trademark Office on July 31, 2001 and published with the pending application on July 11, 2002 (US Publication No. US 2002/0091655 A1). Upon request by the Examiner, Applicants will gladly provide a second copy of the substitute drawings.

CLAIMS

Claims 1-14 are pending in this application.

To overcome the claim objections listed on page 2 of the Office Action, Applicants have amended claims 1, 7, 8, and 14, as suggested by the Examiner.

Claims 2, 4, 5, 7, and 9-14 have been amended to correct antecedent basis. Specifically, claims 2 and 9 have been amended to recite "the set of *n*-dimensional input patterns," which finds basis in claim 1 and 8. Claims 2, 5, 9, and 12 have been amended to recite "with respective pattern subsets C_i." Claims 4, 7, 11, and 14 have been amended to recite "a reference point c_j." Claims 10 and 13 have been amended to recite "said first computer readable program code means" which finds antecedent basis in claim 8.

No amendments have been made to obviate the prior art and no new matter has been introduced.

The Rejection of Claims 1-14 under 35 U.S.C. § 112 Second Paragraph has Been Overcome

Claims 1-14 are rejected as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. *See* Office Action at p. 3. The Examiner asserts that the phrases "a set of *n*-dimensional input patterns" and "an *m*-dimensional output space" are unclear as to what the metes and bounds of the variables *n* and *m* are. *Id.* Applicants respectfully disagree.

35 U.S.C. § 112, second paragraph, states that the "specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." "The 'distinctly claiming' requirement means that the claims must have a clear and definite meaning when construed in light of the complete patent document." *Miles Lab., Inc. v. Shandon Inc.*, 997 F.2d 870 (Fed. Cir. 1994), *cert. denied*, 510 U.S. 1100 (1994). "The test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification . . . . If the claims read in light of the specification reasonably apprise those skilled in the art of the scope of the invention, § 112 demands no more." *Id.* Thus, the operative standard for determining whether the claims are definite is whether those skilled in the art would understand what is claimed when the claim is read in light of the specification. *Beachcombers, Int., Inc. v. WildeWood Creative Products, Inc.*, 31 F.3d 1154 (Fed. Cir. 1994).

The method and computer product of pending claims 1-14 are directed to mapping input patterns of high dimensionality into a lower dimensional space so as to preserve the relationships between these patterns in the higher dimensional space. As such, the method in claims 1-7 and the computer product in claims 8-14 can be used to reduce the dimensionality of large data sets, where *n*-dimensional input patterns represent the points from the large data sets and *m*-dimensional output represent the output points which have been reduced. *See, e.g.,* Specification at p.8, ¶17. Applicants respectfully assert that in light of the disclosure provided throughout the application and the teachings of the prior art, one of ordinary skill in the art would understand that *n* and *m* as used in the

claims and throughout the specification are not specific integers, but rather represent the number of dimensions where $m < n$.

Applicants respectfully assert that in light of the disclosure provided throughout the application, the teachings of the prior art, and the claim interpretation that would be given by one possessing the ordinary level of skill in this field, one of ordinary skill in the art would understand the metes and bounds of the phrases "*n*-dimensional input patterns" and "*m*-dimensional output space." Therefore, withdrawal of this rejection is respectfully requested.

The Examiner also rejected claims 2, 4, 5, 7, and 9-14 as indefinite for improper antecedent basis. As discussed above, Applicants have amended these claims to correct the antecedent basis.

The Rejections of Claims 2, 4-5, 7, and 9, 11-12, and 14 under 35 U.S.C. § 101 Should Be Withdrawn

Claims 2, 4-5, 7 and 9, 11-12, and 14 are rejected as being directed to non-statutory subject matter. Office Action at pp. 3-4. Applicants respectfully assert that this rejection is improper.

To properly make a rejection under 35 U.S.C. § 101 the Examiner must establish that "the claimed invention as a whole is directed to solely an abstract idea or to manipulation of abstract ideas or does not produce a useful result. Only when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under 35 U.S.C. § 101." M.P.E.P. § 2106(II)(A).

Correctly, the Examiner has noted that independent claims 1 and 8 are directed towards patentable subject matter. However, the Examiner has rejected dependent claims 2, 4, 5, 7, 9, 11, 12, and 14 as being directed to non-patentable subject matter. Office Action at p. 4. By definition, a dependent claim contains each and every limitation of the independent claim from which it depends. *See* 35 U.S.C. § 112, paragraph IV. Therefore, Applicants respectfully assert that because independent claims 1 and 8 are directed to patentable subject matter, dependent claims 2, 4, 5, 7, 9, 11, 12, and 14 must also be directed to patentable subject matter.

For the foregoing reasons, Applicants respectfully request withdrawal of this rejection.

The Rejection of Claims 1-14 under 35 U.S.C. § 102 (b) Should Be Withdrawn

Claims 1-14 are rejected as being anticipated by Pao (U.S. Patent Number 5,734,796). For the reasons discussed herein, Applicants respectfully disagree.

As noted by the Federal Circuit, anticipation under 35 U.S.C. § 102 occurs only "when the same device or method, having all of the elements contained in the claim limitations, is described in a single prior art reference." *Crown Operations International, Ltd. v. Solutia, Inc.*, 289 F.3d 1367 (Fed. Cir. 2002). "A single prior art reference anticipates a patent claim if it expressly or inherently describes each and every limitation set forth in the patent claim." *Trintec Industries, Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292 (Fed. Cir. 2002). Moreover, the "single reference must describe the claimed invention with sufficient precision and detail to establish that the subject matter existed in the prior art." *Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116 (Fed. Cir. 2002). *See also In re Spada*, 911 F.2d. 705, 708 (Fed. Cir. 1990) (stating that "the reference must describe the applicant's claimed invention sufficiently to have placed a person of ordinary skill in the field of the invention in possession of it."); *PPG Indus., Inc. v. Guardian Indus., Corp.*, 75 F.3d 1558 (Fed. Cir. 1996) ("To anticipate a claim, a reference must disclose every element of the challenged claim and enable one skilled in the art to make the anticipating subject matter.").

Applicants respectfully assert that because Pao fails to teach or suggest each element of the claimed invention, Pao does not anticipate or render obvious pending claims 1-14.

Pao fails to teach or suggest "creating a set of locally defined neural networks trained according to a mapping of a subset of the n-dimensional input patters into an m-dimensional output space" or "mapping additional m-dimensional input patterns using the locally defined neural networks"

The Examiner alleges that the steps of "creating a set of locally defined neural networks trained according to a mapping of a subset of the *n*-dimensional input patterns into an m-dimensional output space" and "mapping additional *m*-dimensional input patterns using the locally defined neural

networks," are disclosed by Pao. Office Action at p. 5. For at least the reasons discussed below, Applicants respectfully disagree.

Pao describes non-linear mapped data which has been dimensionally reduced by a neural network. Details of the neural net design in terms of number of neurons within each layer are discussed and examples of data which has been dimensionally reduced are given. *See, e.g.,* Pao at Fig 1b, Pao at col. 4, ll. 54-56, Pao at col. 5; and Pao at col. 8, ll. 8-37.

Contrastingly, the steps of "creating a set of locally defined neural networks" and "mapping additional *m*-dimensional input patterns using the locally defined neural networks," as required by claims 1-14 of the instant application, create local neural networks which are defined using a clustering methodology.

Thus, because Pao fails to teach or suggest "creating a set of locally defined neural networks" and "mapping additional *m*-dimensional input patterns using the locally defined neural networks," Applicants respectfully assert that Pao does not anticipate or render obvious claims 1-14.

> *Pao fails to teach or suggest "determining c n-dimensional reference point," "partitioning T into c disjoint clusters C_j based on a distance function d," or "training c independent local networks with the respective pattern subsets C_j"*

The Examiner alleges that the steps of "determining *c n*-dimensional reference point," "partitioning *T* into *c* disjoint clusters C_j based on a distance function *d.*," and "training *c* independent local networks with the respective pattern subsets C_j," as recited in dependent claims 2, 5, 9, and 12 of the instant application, are anticipated by Pao. For at least the reasons discussed below, Applicants respectfully disagree.

As discussed above, Pao describes non-linear mapped data which has been dimensionally reduced by a neural network. Details of the neural net design in terms of number of neurons within each layer are discussed and examples of data which has been dimensionally reduced are given. *See, e.g.,* Pao at Fig 1b, Pao at col. 4, ll. 54-56, Pao at col. 5; and Pao at col. 8, ll. 8-37.

Contrastingly, the instant application creates local neural networks around a clustering method by training separate neural nets associated with clusters C_i with centers c_i. Thus, unlike the method described by Pao, dependent claims 2, 5, 9, and 12 determine the closest cluster center for each of the input/output points by separating the training set into clusters based on the nearest distance between the input/output points and the centers, and then training the independent local neural networks based on those clusters.

Because Pao fails to teach or suggest of "determining c n-dimensional reference point," "partitioning T into c disjoint clusters C_j based on a distance function d," or "training c independent local networks with the respective pattern subsets C_j," Applicants respectfully assert that Pao does not anticipate or render obvious claims 2, 5, 9, and 12.

Pao fails to teach or suggest "using a clustering methodology"

The Examiner alleges that the step of "using a clustering methodology," as recited in dependent claims 3, 6, 10 and 13 of the instant application, is anticipated by Pao. Office Action at pp. 6-7. For at least the reasons discussed below, Applicants respectfully disagree.

In the background of the invention, Pao describes two approaches previously used for the purpose of self-organizing data, one of which involves clustering. However, Pao teaches away from this method and instead describes a new approach for self-organizing data -- non-linearly mapping without using any clustering technique. *See, e.g.,* Pao, col. 1, ll. 54-61.

Contrastingly, dependent claims 3, 6, 10, and 13 of the instant application use a clustering methodology to further optimize the networks. This clustering methodology uses reference points c_i which are distributed and produce balanced partitions that contain a comparable number of training patterns. In order to avoid the creation of poorly optimized networks due to an insufficient number of training cases, the reference point c_i is determined using clustering methods such as the fuzzy clustering means algorithm. *See, e.g.,* Specification at p. 22, ¶67. Thus, unlike the method described in Pao, which does not use clustering methodology, dependent claims 3, 6, 10 and 13 optimizes the

networks after being non-linearly mapped and refined by use of other clustering algorithms rather than using a neural network to non-linear map data as described in Pao.

Thus, because Pao fails to teach or suggest "using a clustering methodology," Applicants respectfully assert that Pao does not anticipate or render obvious claims 3, 6, 10 and 13.

Pao fails to teach or suggest "for an additional n-dimensional input pattern, determining the distance to each reference poin in $\{c_i\}$," "identifying the reference point c_j, closest to the input pattern x," and "mapping x--> y, y ϵ R^m, using the local neural network Net_j^L associated with the reference point c_j identified in step (ii)"

The Examiner alleges that the steps of "for an additional n-dimensional input pattern, determining the distance to each reference point in $\{c_i\}$," "identifying the reference point c_j, closest to the input pattern x," and "mapping x--> y, y ϵ R^m, using the local neural network Net_j^L associated with the reference point c_j identified in step (ii)" as recited in dependent claims 4, 7, 11, and 14 of the instant application, are anticipated by Pao. Office Action at pp. 6-7. For at least the reasons discussed below, Applicants respectfully disagree.

As discussed above, Pao describes non-linear mapped data which has been dimensionally reduced by a neural network. Details of the neural net design in terms of number of neurons within each layer are discussed and examples of data which has been dimensionally reduced are given. *See, e.g.,* Pao at Fig 1b, Pao at col. 4, ll. 54-56, Pao at col. 5; and Pao at col. 8, ll. 8-37. Pao does not teach or suggest what is done with additional input data.

Claims 4, 7, 11, and 14, however, are directed towards mapping additional input patterns by determining the distance to each center cluster and identifying the closest center and mapping the output by using the local neural network associated with that closest identified center.

Because Pao fails to teach or suggest the steps of "for an additional n-dimensional input pattern, determining the distance to each reference point in $\{c_i\}$," "identifying the reference point c_j, closest to the input pattern x," and "mapping x--> y, y ϵ R^m, using the local neural network Net_j^L associated with the reference point c_j identified in step (ii)" Applicants respectfully assert that Pao does not anticipate or render obvious claims 4, 7, 11 and 14.

CONCLUSION

Applicants believe that for the reasons set forth above, claims 1-14 are in condition for allowance and respectfully request prompt and favorable action. Please charge any fee due in connection with this submission to Deposit Account No. 23-2415.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (858) 350-2319.

Respectfully submitted,

WILSON SONSINI GOODRICH & ROSATI
Professional Corporation

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Aubrey A. Haddach, Agent for Applicant
Registration No. 48,374